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PRESCHOOL CHILDREN'S WILLINGNESS TO TRY DIFFICULT TASKS.

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INSTRUMENTS WERE ADMINISTERED TO PRESCHOOL CHILDREN TO MEASURE THEIR PERFORMANCE ON VARIOUS TASKS. THE INSTRUMENTS WERE (1) A BUTTONING TASK FOR FINE MOTOR COORDINATION, (2) A PUZZLE TASK FOR VISUAL DISCRIMINATION, AND (3) A TARGET GAME FOR GROSS MOTOR COORDINATION. EACH INSTRUMENT CONSISTED OF FIVE TASKS GRADED IN DIFFICULTY, ADJUSTED TO THE CHILD'S ABILITY. THE SAMPLE USED IN THE DEVELOPMENT OF THE INSTRUMENTS CONSISTED OF 328 CHILDREN RANGING FROM 3 TO 6 YEARS OF AGE. EACH CHILD STARTED WITH EASY TASKS AND GRADUALLY WENT TO MORE DIFFICULT ONES. THE RESULTS INDICATED THAT WILLINGNESS TO TRY DIFFICULT TASKS MAY BE A PERSONALITY CONSTANT. OF THE THREE INSTRUMENTS, THE TARGET GAME WAS SUGGESTED AS THE MOST PROMISING FOR FUTURE STUDIES. (RS)

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**PRESCHOOL CHILDREN'S WILLINGNESS  
TO TRY DIFFICULT TASKS**

**Cooperative Research Project No. 5-0333**

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of  
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## PROBLEM

The purpose of the present research was to develop three instruments for the measurement of preschool children's willingness to try difficult tasks. In the literature, risk-taking, or willingness to try the difficult, has been specifically referred to as a motivational characteristic of the creative person; and instruments for the measurement of this characteristic in young children are needed for use in longitudinal studies of creative ability.

Theoretically, the creative person enjoys a calculated risk in which success or failure depends on his own ability. He enjoys activities in which the risk is neither too great (as when success depends on luck) nor too easy (as when success is assured). Therefore, instruments which are developed for the measurement of this characteristic must be based on abilities which can be measured objectively, and must be designed so that they can be adjusted to offer each child easy and difficult tasks relative to his own ability.

## Rationale

Carl Rogers (1959) defined the creative process as "the emergence in action of a novel relational product, growing out of the uniqueness of the individual on the one hand, and the materials, events, people, or circumstances of his life on the other;" and he defined the motivation for creativity as "man's tendency to actualize himself; to become his potentialities." (pp. 71-72). Here Rogers implied that the individual will become or achieve his potentialities by using his own means rather than those forced upon him. To do this, the individual must be relatively free from inhibition, free to make novel combinations of ideas, free to express his curiosity and imagination; and his need for approval and affiliation must be secondary to his willingness to try the difficult and his willingness to be different.

Lowenfield (1959) referred to the untapped creative resources of the individual as potential creativity and to that part of his creativeness which the individual uses in his work and actions as functional creativity. Whether or not one believes that every child is born with a creative potential, few would deny that the expression of creative ability has been stifled in many individuals. This gives rise to the question of whether creative potential can be identified before there has been creative achievement. Golovin (1963) expressed the belief that the only identification possible at an early stage of an individual's development is his creative facility rather than his creative ability. Such identification seems necessary if the stifling of creative ability is to be avoided. Also, the identification of

young children who are potentially creative is necessary if longitudinal studies are to provide information about factors which encourage and factors which handicap the development of creative ability.

Taylor (1959) categorized the characteristics of the creative individual as intellectual, those which seem to be valid indicators of creative talent, and motivational, those which facilitate the expression of creative ability or operate as obstacles to creativity. Originality, adaptive flexibility, and the ability to sense problems are examples of intellectual characteristics. Tolerance of ambiguity, freedom to be a nonconformist, and willingness to try the difficult are examples of motivational characteristics. Guilford (1957) found significant correlations between measures of traits of temperament and motivation (motivational characteristics) and measures of factors of ability within the area of creative performing (intellectual characteristics); e.g., impulsiveness and ascendance are related to ideational fluency; tolerance of ambiguity and less need for discipline and orderliness are related to originality. Taylor (1959) expressed the "hunch" that certain of the intellectual components may underlie certain motivational forces in the creative person. Similarly, Torrance (1962) hypothesized that individuals develop certain attitudes which facilitate creative growth and others which operate as obstacles to creativity; and Getzels and Jackson (1962) stated that "general cognitive style and general motivational structure are inextricably related and can be separated only for analytic purposes." (p. 28). These theoretical discussions and research reports suggest that the identification of motivational characteristics may provide the means for identifying young children who are potentially creative. In other words, it may be possible to identify the creative child by his psychological freedom, his willingness to try the difficult, and his freedom to use conforming and non-conforming behavior, for example.

Torrance (1962) and Getzels and Jackson (1962) developed instruments for the measurement of characteristics which are indicative of creative ability or essential for its expression, and used these instruments in the study of school age children and adolescents. Torrance, as a result of his findings, postulated that restrictions on manipulativeness and curiosity, overemphasis on sex roles, overemphasis on prevention, and premature attempts to eliminate fantasy are special blocks to creativity. Each of these can be seen as a restriction which curtails the child's freedom. Similarly, this need for freedom in the creative process has been indicated by Getzels and Jackson in their comparison of highly intelligent and highly creative adolescents. The highly creative were more stimulus-free and less categorical; they had an internal locus of evaluation rather than depending upon the evaluative judgment of others; and they were able "to toy with elements and concepts" and "to make the given problematic". These studies give additional support to the contention that certain motivational characteristics are essential for the expression of creative ability.

Longitudinal studies of the development of creative ability are now needed. The initiation of such studies is dependent upon the development of instruments for use with preschool children in the identification of characteristics which may be related to creativity. The present research is seen as a contribution to this area of study; and as such, it is of particular significance to education.

The development of creative ability is one of the primary objectives of education. Educators make a distinction between knowing and discovering, between remembering and inventing, between intelligent behavior and creative behavior; nevertheless, the focus of attention has been on ability and progress, i.e., intelligence and achievement, and the development of creative ability has been left largely to chance. The problem is complex. Children need a wealth of knowledge and experience upon which to draw if they are to express their creative ability. Thus, from the educator's point of view, the problem is one of how to leave the imaginations of children free while giving them the facts and experiences necessary for possible creative activity.

### OBJECTIVES

1. To develop three research instruments for the measurement of preschool children's willingness to try difficult tasks, each instrument based on a different ability and designed so that ability can be controlled. The following questions are related to this major objective:

a. Is willingness to try the difficult a function of ability? (e.g., Do children of high ability demonstrate one degree of willingness to try the difficult and children of lesser ability demonstrate another degree of this characteristic?)

b. Is willingness to try the difficult a constant personality characteristic? (e.g., Does a given child demonstrate one degree of willingness to try the difficult in a situation in which he is highly skilled and another degree in a situation in which he is less skilled?)

c. Among preschool children, are there sex differences in willingness to try the difficult?

d. Among preschool children, are there age differences in willingness to try the difficult?

2. To develop a plan for the study of the relationships among the characteristics which seem to be essential for the expression of creative ability, explicitly those for which instruments for use with young children have been developed.

3. To develop, on the basis of leads obtained during the present study, a plan for the development of instruments to measure other characteristics postulated as being related to creative ability or essential for the expression of creative ability, e.g., originality.



### RELATED RESEARCH

Few writers have referred specifically to willingness to try the difficult; however, this characteristic is implied in the studies of goal-setting behavior and level of aspiration (e.g., Lewin, 1944; Sears, 1950). For the proposed research, these studies have contributed information about factors which affect goal-setting behavior and have indicated specific problems which arise in the study of young children.

Two major ways in which the present research differs from level of aspiration research are as follows: (1) Willingness to try the difficult is measured for each child in terms of his own ability, i.e., ability is controlled; and (2) the study of willingness to try the difficult is essentially a study of the influence of potential success and failure; whereas, in the level of aspiration research, considerable emphasis is placed on experienced success and failure, even to the extent that in some studies success and failure have been induced by the experimenter.

Risk-taking, as a characteristic of the creative person, has been referred to by Torrance, Getzels and Jackson, McClelland, and others. In studying the relationship between need-Achievement and risk-taking, McClelland (1961) found that children five and six years old, who have high need-Achievement, tend to choose goals which offer a moderate risk of failure. Here McClelland demonstrated the importance of success as a function of ability, rather than luck. In a study of creative physical scientists, he found a relationship between moderately high need-Achievement and moderately high risk-taking. His interpretation was that the preference for risk-taking activities was not only a function of motivation, but also of ability and opportunity.

McClelland's statement is somewhat analogous to the writer's expressed belief that goal-setting behavior is a function of ability, willingness to try the difficult, and the potency of the situation. Thus, willingness to try the difficult, as a characteristic of the individual, should be indicated by his goal-setting behavior when the ability of the subject and the potency of the situation are controlled.

Three unpublished studies served as pilot work for the present research.

#### A Target Game for Elementary School Children

A beanbag target game was developed by Starkweather (1957) for use in a study of the goal-setting behavior of elementary school children. In this study the method of scoring was complex and ability was controlled statistically. The research instrument consisted of fifteen separate targets, so placed that they offered every child extremely easy and extremely difficult goals from which to choose. Each child's ability in the game was estimated from his performance, and this ability measure was then used to estimate the relative difficulty of the individual targets for the child. His performance was then expressed in standard scores independent of his ability. The results

of the study showed that children of comparable ability had markedly different scores for willingness to try the difficult, and this finding was accepted as an indication that willingness to try the difficult cannot be rely a function of ability.

Children from all grade levels in elementary school enjoyed the beanbag target game; nevertheless, there were indications that the performance of some children was affected by the extremely wide range of target distances. The more skilled children chose to play the game at a relatively easy level, and the less skilled children chose to play the game at a relatively difficult level.

In a study of level of aspiration, Anderson and Brandt (1939) demonstrated that children are influenced by knowledge of the performance of others. Those of high ability tend to lower their goals and those of low ability tend to raise their goals, thereby approximating the mean for the group. In the Starkweather study, the children had no knowledge of the performance of others in the beanbag target game; however, the wide range of targets may have suggested an ability range for the group and thereby prompted behavior similar to that observed by Anderson and Brandt. This suggests that when an adjustment for ability is made in the administration of a similar task, the midpoint in the range of difficulty levels offered to a child should be the level at which he has approximately a 50 per cent chance of success.

#### A Reading Task for First Grade Children

A Study of conscientious effort in first grade children was done by Tether (1961) under the supervision of the writer. In this study a reading task was developed for the measurement of willingness to try the difficult, and a natural setting was provided by the regular classroom reading periods. On the assumption that short sentences are easier than long sentences and familiar words are easier than newer words, easy and difficult sentences were constructed for each child from his current reading material. Over a period of days, during the regular reading period, each child was offered his choice in 40 pairs of sentences, one sentence being easy and the other difficult. The child's score was the number of difficult sentences that he chose to read.

The reading task did distinguish between children who avoided the difficult and those who were willing to try the difficult, as indicated by scores ranging from 6 to 30. The responses of children in three ability groups, i.e., reading groups determined by school achievement, were significantly different ( $\chi^2 = 10.45$ ;  $p < .01$ ). The children of high ability were the ones who chose the difficult sentence most frequently; and the children of medium ability, rather than those of low ability, were the ones who chose the difficult sentence least frequently. (High Ability  $\bar{X} = 16.3$ ). This relationship appears to be curvilinear and suggests that willingness to try the difficult is not merely a function of ability.

The design of the reading task and the results of the study suggest that a research instrument which gives children sufficient opportunity to make simple choices between the easy and the difficult will distinguish

between the child who avoids the difficult and the child who is willing to try the difficult.

### Instruments for Use with Preschool Children

The development of three instruments for the measurement of preschool children's willingness to try difficult tasks was initiated by Ahmed (1963) under the supervision of the writer. The criteria for these instruments were similar to those suggested for instruments measuring level of aspiration. The objective measurement of the child's ability should be possible in order that he be offered tasks which are easy and difficult relative to his own ability. The difficulty of each task should be obvious to the child and he should see himself as responsible for the success or failure that he experiences, i.e., success and failure should not be induced by the experimenter. Environmental factors which might influence the potency of a success or failure, should be controlled insofar as possible in the experimental situation.

Consideration of the above criteria led to the development of three instruments, each based on a different skill or ability. These were (1) a jumping task, based on gross motor ability; (2) a buttoning task, based on fine motor coordination; and (3) a puzzles task, based on the ability to see visual relationships. For each instrument a method was devised for measuring the ability of individual children and then adjusting the instrument so that each child could be offered his choice between easy and difficult tasks, relative to his own ability. Insofar as possible, the environmental factors of the experimental situation were held constant for the administration of the three instruments. The same room and the same experimenter were used for all data gathering, and no person other than the experimenter observed the children. The subjects were 24 nursery school children, nine boys and 15 girls, who ranged in age from 4 years 0 months to 5 years 6 months.

Jumping Task - This task was adapted from the Sears and Levin (1958) study of level of aspiration in preschool children. Five colored balls were suspended from a horizontal bar. The height of the bar was adjusted for each child so that the lowest ball was within fingertip reach. The other balls were suspended two, four, six, and eight inches higher than this lowest ball. Each child was given two trial jumps for every ball, in order that he know the range of difficulty before playing the game. He then chose the balls for which he wanted to jump, for a total of ten jumps.

An ability score and a play score were figured from each child's performance on the jumping task. The ability score indicated the level of difficulty at which the child had a 50 per cent chance of success; and the play score indicated the level of difficulty at which he chose to play the game. The difference between these two scores indicated whether the child chose to play the game at an easy or difficult level relative to his own ability.

Data analysis indicated a negative relationship between ability and willingness to try the difficult. This relationship proved to be an artifact of the instrument. A child of high ability would have difficulty obtaining



a positive score unless he confined his choices to the two most difficult levels; and similarly, a child of low ability would have difficulty obtaining a negative score.

Other problems with the jumping task were indicated by the tendency of some children to jump repeatedly for a chosen ball instead of making one discrete jump, and by the difficulty which a few children had in jumping for something even though they might jump with abandon in their play.

Buttoning Task - Buttons of six different sizes were used in this task. The skill of each child was determined by the speed with which he buttoned a trial strip, consisting of one button of each size. He was then offered his choice in a series of paired buttoning strips, one easier than the other, each strip consisting of four buttons of the same size. (Large buttons are easier than small buttons.) Ten pairs of buttoning strips were presented to each child. The less skilled children were offered choices between two of the easier buttoning strips, and the more skilled children were offered choices between two of the more difficult strips.

The score for this task was a simple count of the number of times a child chose the more difficult buttoning strip. The range of possible scores was from 0 to 10; and the actual range of scores was from 0 to 7.

There was no significant difference between the responses of the high ability group and the medium-low ability group. (For the purpose of statistical analysis, the medium and low ability groups were combined.) Apparently, in the buttoning task the adjustment for ability was adequate and the buttoning strips offered to each child were easy and difficult relative to his own ability.

Puzzles Task - Puzzles of four levels of difficulty were made from simple animal pictures. Each puzzle consisted of three, four, six, or nine pieces, the number of pieces indicating the difficulty of the puzzle. For each puzzle, the pieces were the same size and shape, e.g., the four piece puzzle was made by cutting the picture into fourths. As in the buttoning task, each child's ability was determined by the speed with which he completed a trial puzzle. The less skilled children were then offered choices between two of the more easy puzzles, e.g., a three-piece and a four-piece puzzle; and the more skilled children were offered choices between two of the more difficult puzzles. The choice was always between two puzzles which would make the same picture, e.g., a rabbit. Ten pairs of puzzles were presented to each child.

As in the buttoning task, the score was a simple count of the number of times a child chose the more difficult puzzle. The range of possible scores was from 0 to 10. The actual range of scores was from 0 to 9.

On the puzzles task, the responses of the children in three ability groups were significantly different ( $\chi^2 = 10.09$ ;  $p < .01$ ). Children in the high ability group chose the easy puzzle more frequently than expected, and children in the low ability group chose the difficult puzzle more frequently than



expected. For these two groups the adjustment for ability was inadequate. The low ability group completed their difficult puzzle (four pieces) with ease; whereas the high ability group frequently could not complete their difficult puzzle (nine pieces). In other words, the easy puzzle was not easy for the high ability group and the difficult puzzle was not difficult for the low ability group.

Comparison of the Three Instruments - Nine children who were in the medium ability group on the puzzles task were used as subjects for this comparison. Most of these children were in the medium or low ability groups on the jumping task, and therefore, their scores were least affected by the apparent faults of that instrument. Rank order coefficients of correlations indicate that children who were willing to try the difficult relative to their own ability on one task, tended to be those who were willing to try the difficult on another task. (For Jumping and Puzzles,  $\rho = +0.683$ ;  $p < .05$ . For Jumping and Buttoning,  $\rho = +0.654$ ;  $p < .10$ . For Puzzles and Buttoning,  $\rho = +0.725$ ;  $p < .05$ .) Here the implication is that willingness to try the difficult is a constant personality characteristic which can be measured if ability and other variables which might influence performance are controlled.

Recommendations - (1) A new gross motor task is needed to replace the jumping task. This should be a task less dependent upon good coordination, and yet based on a measurable skill. (2) The buttoning task and the puzzles task should be refined so that the administration and scoring can be similar for all three instruments. (3) A wide range of difficulty levels should be planned for each task in order that all children be offered choices between the easy and the difficult relative to their own ability. (4) The design of each task should be such that the child's choices are made between two discreet levels of difficulty, clearly identified as easy and difficult.

## DEVELOPMENT OF THREE RESEARCH INSTRUMENTS

### Introduction

Three research instruments were developed for use in the measurement of preschool children's willingness to try difficult tasks. These included (a) the refinement of the buttoning task and the puzzles task described above, and (b) the development of a target game to replace the jumping task which was not suitable for use with preschool children. For each of these instruments an adjustment was possible so that each child could be offered tasks which were easy and difficult relative to his own ability.

The administration of the three instruments was similar. A child's ability was determined in a pretest, and he was then assigned to one of three ability groups for which the instrument could be adjusted. Each instrument, as presented to the child, consisted of a set of five tasks graded in difficulty. The experimenter explained that the tasks at one extreme were very easy and those at the other extreme were very hard. In the game which the child then played, the experimenter indicated two tasks between which the child was to choose and again emphasized the relative difficulty of each by saying, "This is the easy one and this is the hard one. Which one do you want to do?" As in a paired-comparisons test, each level of difficulty was paired with every other level, and the order of presentation was such that the child started with the easier tasks and was gradually introduced to those which were more difficult. Each pair of tasks was presented to the child twice, thus offering him a total of 20 choices between the easy and the difficult. The directions were always given in the same order, with the easy task being indicated first. This was one of several efforts to assure a consistent presentation so that the child would at no time be confused about the relative difficulty of the two tasks between which he was choosing.

The order of presentation of the paired tasks was as follows, with "A" representing the easiest level of difficulty:

- |                   |                    |
|-------------------|--------------------|
| 1. A - B<br>A - B | 6. A - C<br>A - C  |
| 2. C - D<br>C - D | 7. B - E<br>B - E  |
| 3. A - E<br>A - E | 8. A - D<br>A - D  |
| 4. B - C<br>B - C | 9. C - E<br>C - E  |
| 5. D - E<br>D - E | 10. B - D<br>B - D |

Two methods of scoring, appropriate for all three instruments, were explored. One method, a simple count of the number of times a child chose the difficult rather than the easy, offered a possible range of scores from 0 to 20. A broader range of scores, from 40 to 80, was offered by a second method in which the child's choices were weighted from one to five depending upon the level of difficulty chosen. The latter method had greater discriminatory power and was accepted for use in the data analysis. A more refined method of scoring, one which offered an additional adjustment for ability, was possible for the target game in which the child's successes and failures could be objectively scored.

The subjects who participated in the research were children from day care centers, nursery schools and kindergartens in several Oklahoma communities. The age range was from 3 years 0 months to 5 years 11 months. The distribution of subjects by age, sex, and ability is described in each section of the research report which follows.

### Buttoning Task

Buttons ranging in size from  $3/8$ " to  $7/8$ " offered seven levels of difficulty for the buttoning task. For convenience in the following discussion, the button sizes are indicated by letter as follows: a =  $7/8$ ", b =  $3/4$ ", c =  $5/8$ ", d =  $9/16$ ", e =  $1/2$ ", f =  $7/16$ ", and g =  $3/8$ ". The buttons were all white and the cloth strips on which they were sewn were of many different colors.

Pilot work, with approximately 175 children, guided the refinement of the buttoning task. Major findings and adjustments in the pilot work were the following:

1. Large buttons were easier for the children than small buttons, and therefore, the buttoning task could be adjusted for ability by offering the more skilled children smaller buttons than those offered to the less skilled children.
2. The buttoning task was inappropriate for highly skilled children, for whom none of the buttons were difficult; and therefore, children who completed the pretest in less than 20 seconds were eliminated from the study.
3. Neither handedness nor sex seemed to influence the way in which the button strips were held, and therefore, the pretest strips were presented in the manner in which most children held them, i.e., with the buttons on the right and the buttonholes on the left.
4. The task, as initially planned with 4-button strips, was tiring for the less skilled children. It consisted of 12 buttons in the pretest and 40 in the task proper (a total of 52 buttons) while providing only ten choices between the easy and the difficult. Pilot work with 1-button and 2-button strips indicated that 1-button strips used throughout the task were sufficiently challenging for the more skilled children and did not tire the less skilled children. The final design, with 1-button strips throughout, consisted of eight buttons in the pretest and 20 in the task proper (a total of 28 buttons) while providing 20 choices between the easy and the difficult.

### Buttoning Pretest

The pretest for the buttoning task consisted of two strips of four size-b buttons. (See Figure 1.) The child buttoned one strip for practice and then was timed while buttoning the second strip. He was assigned to an ability group on the basis of the skill he demonstrated on the pretest. (See Table I.) For each ability group an adjustment of the buttoning task was planned so that each child was offered buttoning strips which were easy and difficult relative to his own ability. (The instrument for each ability group consisted of five button sizes as indicated in Table I.)



Figure 1. The Pretest for the Buttoning Task.

TABLE I  
PRETEST TIMING AND BUTTONING TASK ADJUSTMENT  
FOR THREE ABILITY GROUPS

Ability	Pretest Time (in Seconds)	Button Sizes at Each Level of Difficulty				
		A	B	C	D	E
Group I	20" to 30"	c	d	e	f	g
Group II	31" to 45"	b	c	d	e	f
Group III	46" or more	a	b	c	d	e

#### Buttoning Instrument

The buttoning instrument consisted of 20 paired 1-button strips representing five levels of difficulty. The strips were made of colored cotton cloth sewn to open like a book, approximately 3" x 2" in size, with a button on one side and a buttonhole on the other. Many bright colors were used in the instrument, but the two strips in each pair were always of the same color.

Administration. The button strips were arranged according to size in a compartmented box. The experimenter showed the child the range of difficulty from easy (largest button) to hard (smallest button) and told him that he could choose the ones that he wanted to do. She then took one button strip from compartment-A and one from compartment-B, opened them and placed them before the child with the buttons toward each other for easy comparison. (See Figure 2.) The directions for the child were "This is the easy one and this is the hard one. Which one do you want to do?" The child buttoned the one he chose. Another A-B pair was then presented. The task continued in this manner and the child made a total of 20 choices between the easy and the difficult.

Scoring. The W-D score, which indicates a child's willingness to try the difficult, is the sum of the weighted scores for the levels of difficulty chosen by the child. Levels A to E are weighted one to five, respectively. A record of the performance and scores for Child-F-1271 is presented in Figure 3.



Subjects. The subjects were 145 children ranging in age from 3 years 0 months to 5 years 11 months. There was no significant difference in the distribution of boys and girls by age or by ability in the buttoning task. (See Chi-square data in Table II.) The older children were significantly more skillful in buttoning than were the younger children. This difference was in the expected direction. ( $\chi^2 = 12.411$ ;  $p < .02$ )

Detailed information about the distribution of subjects is presented in Tables XII - XXVII, Appendix A.



Figure 2. A child choosing the "hard" one on the buttoning task.



Name CHILD - F - 1271Sex FBirthdate 2-19-62Age 4:2**BUTTONING TASK**Date: 4-11-66Pretest: 23"Group: IW-D Score: 60**PUZZLES TASK**Date: 4-14-66Pretest: 40"Group: IIW-D Score: 571. (A) - B  
A - (B)6. (A) - C  
A - (C)1. (A) - B  
(A) - B6. (A) - C  
A - (C)2. (C) - D  
C - (D)7. (B) - E  
B - (E)2. (C) - D  
C - (D)7. (B) - E  
B - (E)3. (A) - E  
A - (E)8. (A) - D  
A - (D)3. (A) - E  
A - (E)8. A - (D)  
(A) - D4. (B) - C  
B - (C)9. (C) - E  
C - (E)4. B - (C)  
(B) - C9. C - (E)  
(C) - E5. (D) - E  
D - (E)10. (B) - D  
B - (D)5. D - (E)  
(D) - E10. (B) - D  
(B) - D

Figure 3. Score Sheet - Performance of Child-F-1271 on the buttoning task and the puzzles task.

TABLE II  
CHI-SQUARE ANALYSIS OF THE DISTRIBUTION OF SUBJECTS  
BY SEX, AGE, AND ABILITY ON  
THE BUTTONING TASK

(N = 145)

Distribution	df	$\chi^2$	p
By Sex and Age	2	2.070	n.s.
By Sex and Ability	2	0.676	n.s.
By Age and Ability	4	12.411	<.02

#### Validity and Reliability

The buttoning task was accepted as having face validity. Willingness to try the difficult was indicated by the choices which a child made between tasks which were easy and difficult relative to his own ability.

The internal consistency of the buttoning task was determined by means of a split-half correlation using the Spearman-Brown formula. For this analysis, the sums of the weighted scores for alternate responses were used; specifically, the sum of the scores for the first choices in the odd-numbered presentations and the second choices in the even-numbered presentations, were correlated with the sum of the scores for the second choices in the odd-numbered presentations and the first choices in the even-numbered presentations.

An analysis of the scores for the first 50 children who participated in the buttoning task yielded a correlation coefficient of +0.868 ( $p < .01$ ), indicating that the instrument was reliable.

#### Adjustment for Ability

The adjustment for ability was tested by timing a group of 47 children on 2-button strips representing the seven levels of difficulty in the task. Median scores, presented in Table III, confirmed the expectation that the larger buttons (a-b-c) would be easier for the children than the smaller buttons (e-f-g). The scores also indicated that the children in Group I were the most skillful and the children in Group III were the least skillful.

**TABLE III**  
**MEDIAN SCORES\* OBTAINED BY THREE ABILITY GROUPS**  
**ON 2-BUTTON STRIPS GRADED IN DIFFICULTY**

Ability	N	Pretest Time (in seconds)	Size of Buttons							Total
			(Large) a	b	c	d	e	(Small) f	g	
Group I	29	20" to 30"	8"	10"	12"	10"	13"	13"	12"	78"
Group II	09	31" to 45"	10"	11"	13"	14"	17"	16"	12"	93"
Group III	09	46" or more	13"	17"	19"	24"	22"	15"	26"	136"
Total	47		31"	38"	44"	48"	52"	44"	50"	

\*Time in seconds.

The buttoning task for Group I children consisted of button sizes c-d-e-f-g. The data suggests that these children were quite skillful in buttoning all sizes of buttons and the task was not actually graded in difficulty for them.

The buttoning task for Group II children consisted of button sizes b-c-d-e-f. The median scores for these button sizes suggest that the task was graded in difficulty for these children but that the range from easy to hard (11" to 17") was moderate. These children seemed to improve in ability as they buttoned the series of 2-button strips. (Buttons e, f, and g were timed at 17", 16", and 12", respectively.)

The buttoning task for Group III children consisted of button sizes a-b-c-d-e. The median scores for these button sizes (13" to 24") suggest that the task was graded in difficulty for these children, but they also seemed to improve in ability as they buttoned this series of strips.

Of the total group of 145 children who participated in the buttoning task, only 18 were in the low ability group, Group III. Also, many children who were pretested for the buttoning task were extremely skillful in buttoning and could not be included in the research. These observations suggest that the buttoning task can be adapted for use only with children who are in the process of learning to button.

For the purpose of the present research, the three different sets of buttoning strips, planned for the three ability groups, were accepted as an adequate adjustment for ability and no further refinement of the task was attempted.

### Willingness to Try Difficult Tasks

The major question to be answered in the data analysis was whether willingness to try difficult tasks was a function of ability, i.e., whether the more skillful children were more willing to try the difficult buttons than were the less skillful children. A Chi-square analysis of the buttoning task data indicated that willingness to try the difficult was independent of ability. ( $\chi^2 = 2.642$ ; n.s.). The range of W-D scores on the buttoning task was from 40 to 79. Some children always chose the easy task, and some chose the easy task only once. This range of scores was approximately the same for all age and ability groups. (See Tables IV and V.)

Chi-square analysis of the buttoning task data further indicated that the older children were more willing to try difficult tasks than were the younger children. ( $\chi^2 = 11.028$ ;  $p < .05$ ). The median W-D score for the three year old children was 48; and for the four and five year old children, the median score was 56. This difference was in the expected direction.

TABLE IV

CHI-SQUARE ANALYSIS OF THE DISTRIBUTION OF SUBJECTS BY SEX,  
ABILITY, AND W-D SCORES ON THE BUTTONING TASK

(N = 145)

Distribution	df	$\chi^2$	p
By W-D Scores and Sex	2	0.728	n.s.
By W-D Scores and Age	4	11.028	<.05
By W-D Scores and Ability	4	2.642	n.s.

TABLE V

RANGES AND MEDIAN W-D SCORES BY SEX, AGE, AND  
ABILITY ON THE BUTTONING TASK

(N = 145)

	N	W-D Scores	
		Median	Range
<u>Age Range</u>			
5:0 - 5:11	19	56	40 - 78
4:0 - 4:11	77	56	40 - 79
3:0 - 3:11	49	48	40 - 78
<u>Ability</u>			
Group I	75	54	40 - 78
Group II	52	49	40 - 79
Group III	18	49	40 - 78
<u>Sex</u>			
Boys	78	53	40 - 78
Girls	67	50	40 - 79
Total	145	52	40 - 79

### Puzzles Task

Puzzles, ranging from two pieces to eight pieces, offered seven levels of difficulty for the puzzles task. All were rectangular in shape and of the same size, approximately 4" x 6". For the pilot work, in which approximately 150 children participated, the puzzles were made of poster board. When the necessary adjustments in the task were determined, more durable puzzles were constructed of masonite.

The pictures used for the puzzles are illustrated in Figure 4. These were painted a solid color on a white background and bordered in black, e.g., a red rooster, a green pig, and a blue boy. The seven levels of difficulty are illustrated in Figure 5.

Major steps in the pilot work were the following:

1. A frame in which the puzzles could be put together was needed. The first child to attempt one of the puzzles asked, "What do I put it in?"
2. Some pictures were more difficult as puzzles than were others. To eliminate this problem, the relative difficulty of 23 pictures was determined by timing 50 children on 3-piece and 4-piece puzzles made from these pictures. Fourteen pictures of approximately equal difficulty were then selected for the puzzles task.
3. Initially, the puzzle pieces were cut with straight edges and the individual pieces were identical in size and shape, e.g., a 4-piece puzzle was merely the picture cut into fourths. With these puzzles, some children succeeded in putting the straight-edged pieces into the frame but failed to complete the picture; thus, a success for the child was a failure from the viewpoint of the experimenter. This problem was solved by cutting the puzzle pieces with curved edges so that the picture would be correct if the pieces were fitted into the frame. The pattern for cutting the curved edges was adapted until no two pieces would fit together unless they belonged together. (This adjustment was tested by timing 29 children on a 3-piece duck puzzle and a 4-piece indian puzzle, both of which were made with straight edges and with curved edges. For 25 of the 29 children, the puzzles with the curved edges were the easier; and for the least skilled children, the curved puzzles were much easier.)
4. The manner in which the puzzle pieces were presented to the children influenced the difficulty of the puzzle. The puzzles were harder when the pieces were upside down or out of place relative to their position in the picture, i.e., if a piece from the right side of the picture was placed at the child's left. To solve this problem, all pieces were placed before the child right side up and in the correct right-left and top-bottom position with respect to the picture. (See the presentation of the 8-piece puzzle in Figure 5.)
5. The general design for the three research instruments required that each pair of tasks be presented twice in succession; therefore, the possibility of presenting each puzzle picture twice was explored. For this, a pilot task was constructed with four pictures, each of which was made in two colors. For each, the number of puzzle pieces remained the same, but the color was changed; e.g., a choice between a 3-piece and a 4-piece blue pig was followed by a choice between a 3-piece and a 4-piece pink



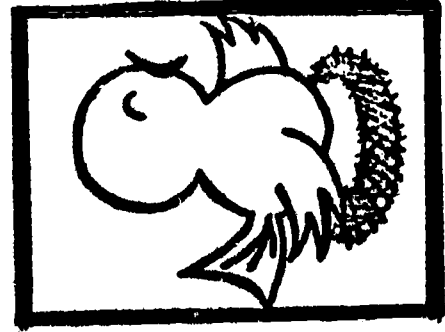

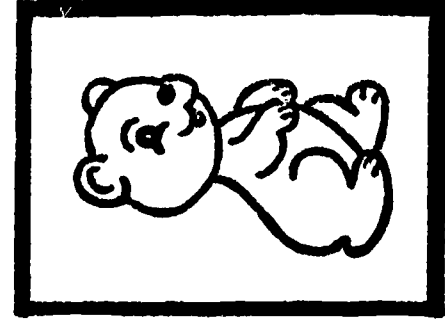
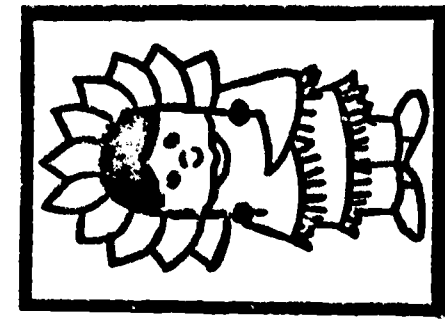
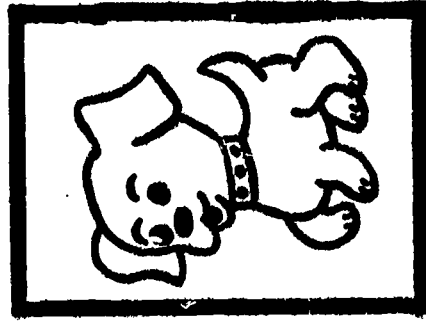

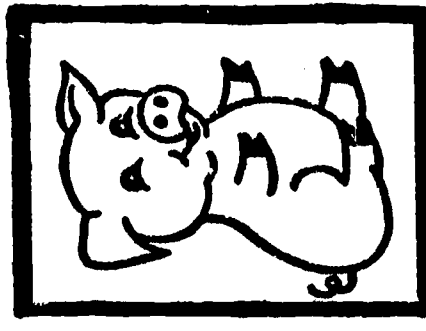
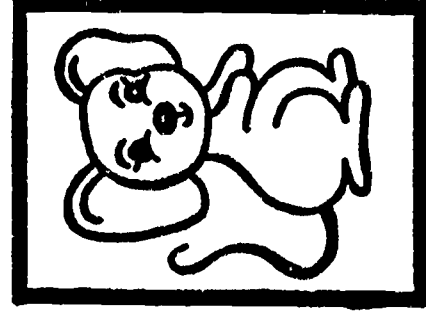
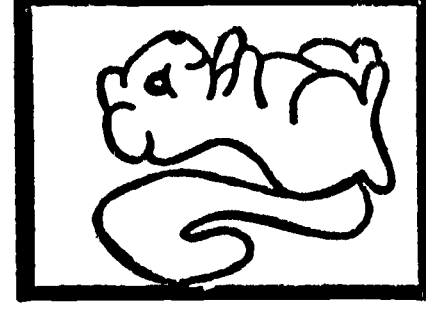
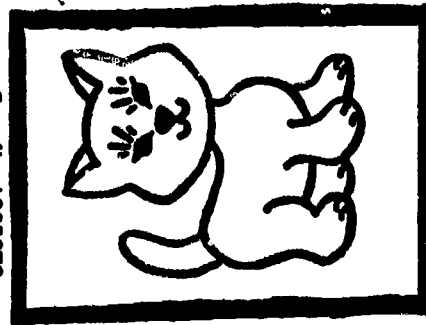
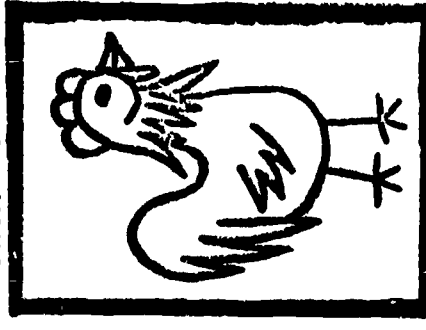
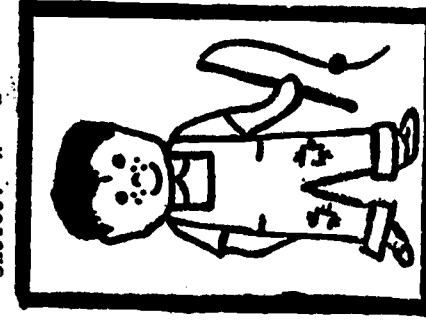
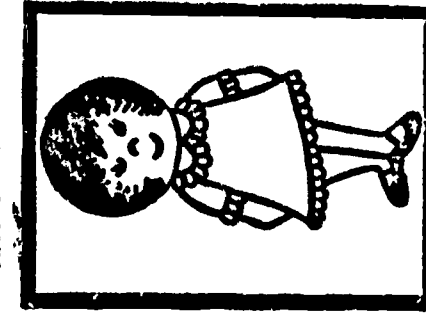
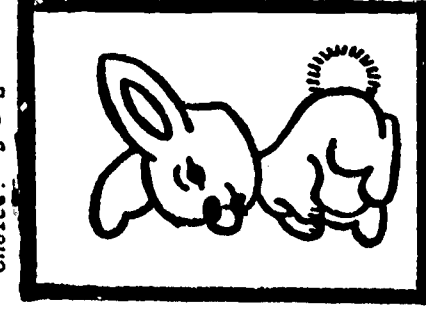
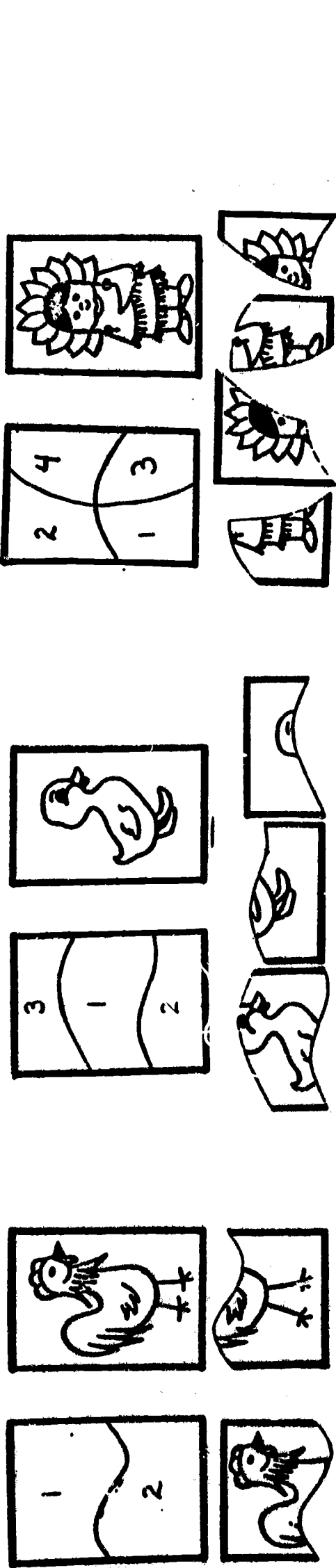
 <p>Demonstration Three-piece Puzzle Orange Bird</p>	 <p>Trial No. 1 Three-piece Puzzle Tan Monkey (timed)</p>	 <p>Trial No. 2 Three-piece Puzzle Light Green Bear (timed)</p>	 <p>Trial No. 3 Four-piece Puzzle Turquoise Indian (timed)</p>	 <p>1 a. Orange Dog b. Medium Blue Dog Choice: A - B</p>	 <p>2 a. Yellow Duck b. Tan Duck Choice: C - D</p>	 <p>3 a. Dark Green Pig b. Pink Pig Choice: A - E</p>	 <p>4 a. Orchid Mouse b. Turquoise Mouse Choice: B - C</p>	 <p>5 a. Dark Brown Squirrel b. Orange Squirrel Choice: D - E</p>	 <p>6 a. Light Blue Cat b. Yellow Cat Choice: A - C</p>	 <p>7 a. Red Rooster b. Medium Green Rooster Choice: E - E</p>	 <p>8 a. Dark Blue Boy b. Tan Boy Choice: A - D</p>	 <p>9 a. Pink Girl b. Dark Rose Girl Choice: C - E</p>	 <p>10 a. Gray Rabbit b. Light Blue Rabbit Choice: B - D</p>
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Figure 4. Puzzles Task - Order of presentation

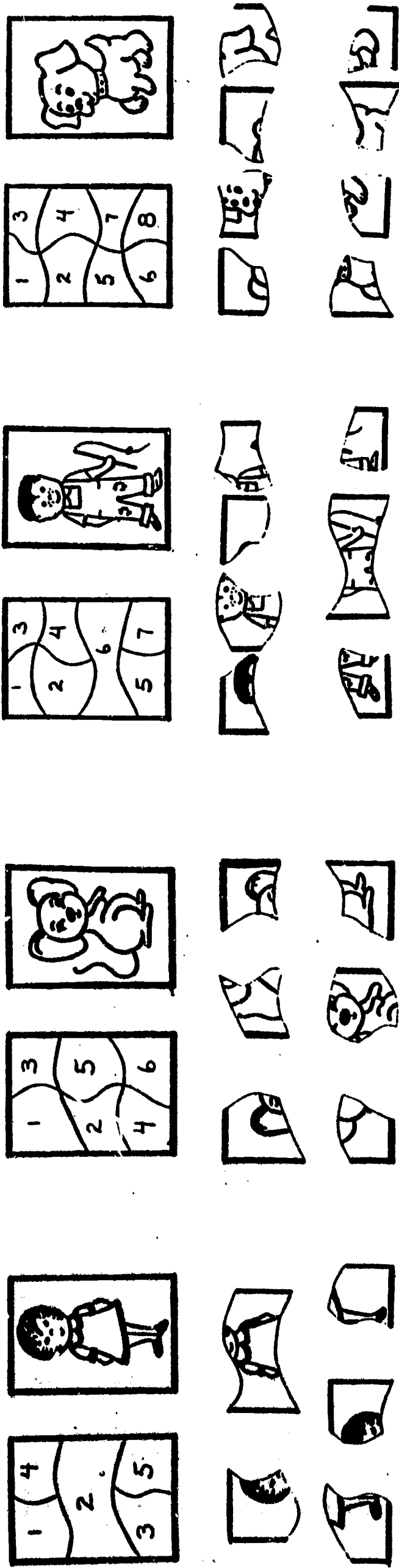
The order of presentation of the puzzle pictures was the same for all three ability groups. Captions indicate the colors of the pictures and the levels of difficulty for which they were constructed.



Two-piece Puzzle

Three-piece Puzzle

Four-piece Puzzle



Five-piece Puzzle

Six-piece Puzzle

Seven-piece Puzzle

Eight-piece Puzzle

Figure 5. Puzzles Task - Seven levels of difficulty.

Puzzles of seven levels of difficulty were used in the measurement of preschool children's willingness to try difficult tasks. The number of pieces in each puzzle indicated its level of difficulty; and for each level, the illustration shows the shapes of the puzzle pieces and the way in which they were presented to the child.



fig. Children maintained their interest during the two successive presentations of each picture, and their responses suggested that this design may increase the power of the task to discriminate among children who are challenged by the difficult and those who are not.

### Puzzles Pretest

The pretest for the puzzles task consisted of four puzzles. (See Figure 4.) The task was introduced with a 3-piece demonstration puzzle. The child was then timed on two 3-piece puzzles and one 4-piece puzzle. The sum of the time required to complete these three puzzles determined the child's ability group. The puzzles then offered to him in the task proper were of a difficulty in keeping with his ability. (See Table VI.)

TABLE VI  
PRETEST TIMING AND PUZZLES TASK ADJUSTMENT  
FOR THREE ABILITY GROUPS

Ability	Pretest Time (in seconds)	Number of Puzzle Pieces at Each Level of Difficulty				
		A	B	C	D	E
Group I.	30" or less	4	5	6	7	8
Group II	31" to 45"	3	4	5	6	7
Group III	46" to 75"	2	3	4	5	6

### Puzzles Instrument

The puzzles instrument consisted of 20 paired puzzles, representing five levels of difficulty. Each of ten different puzzle pictures was made in two colors which were presented consecutively during the task. In Figure 4, the pictures are shown in the order of their presentation. The captions indicate the colors of the pictures and the levels of difficulty for which the puzzles were constructed. For convenience during the administration of the task, each puzzle was placed in a clear plastic envelope. These were arranged in a compartmented box according to levels of difficulty and order of presentation.

Administration. The box of puzzles and two puzzle frames were placed on the table in front of the child. As in the buttoning task, the experimenter showed the child the range of difficulty from easy to hard and then told him that he was going to choose the puzzles that he wanted to do. She put the first picture, an orange dog, in one of the puzzle frames and told the child that he could make a dog just like it. She then lifted

an envelope of puzzle pieces from compartment-A and another from compartment-B, and placed them on the table directly in front of the compartments from which they had been taken. This was done in order to help the child understand the relative difficulty of the two puzzles. (See Figures 6 and 7.) The child was then told, "This is the easy one and this is the hard one. Which one do you want to do?" If necessary, the child was again told that both puzzles would make the orange dog. When the child completed the puzzle that he chose, an A-B pair of puzzles for making a blue dog was presented. The task continued in this manner and the child made a total of 20 choices between the easy and the difficult.

The order in which the puzzle pictures were presented was the same for all three ability groups, even though the difficulty of the puzzles varied from one group to the next. For example, each child began with the orange dog, but the number of pieces in the puzzle was determined by the child's ability. For example, for the first picture, the low ability children (Group III) chose between a 2-piece and a 3-piece puzzle, whereas the high ability children (Group I) chose between a 4-piece and a 5-piece puzzle.

Scoring. The W-D score indicates the child's willingness to try difficult tasks. As in the buttoning task, it is the sum of the weighted scores for the levels of difficulty chosen by the child. Levels A to E are weighted one to five, respectively; and the score sheet for the puzzles task is identical to that for the buttoning task. (See Score Sheet for Child-F-1271 on page 17.

### Subjects

The subjects who participated in the puzzles task were 82 children ranging in age from 3 years 2 months to 5 years 11 months. There was no significant difference in the distribution of boys and girls by age or by ability. (See Chi-square data in Table VII.) The older children were significantly more skillful with the puzzles than were the younger children. This difference was in the expected direction. ( $\chi^2 = 17.063$ ;  $p < .001$ ).

Detailed information about the distribution of subjects is presented in Table XXVIII - XXXIII, Appendix A.



Figure 6. A child choosing the "easy" one on the puzzles task.



Figure 7. A child putting together the puzzle she has chosen.

TABLE VII  
CHI-SQUARE ANALYSIS OF THE DISTRIBUTION OF SUBJECTS  
BY SEX, AGE, AND ABILITY ON THE PUZZLES TASK

(N = 82)

Distribution	df	$\chi^2$	p
By Sex and Age	2	0.083	n.s.
By Sex and Ability	2	2.667	n.s.
By Age and Ability	2	17.063	<.001

#### Validity and Reliability

The puzzles task was accepted as having face validity. Willingness to try the difficult was indicated by the choices which a child made between tasks which were easy and difficult relative to his own ability.

The internal consistency of the puzzles task was determined by means of a split-half correlation using the Spearman-Brown formula. As in the buttoning task, the sums of the weighted scores for alternate responses were used for this analysis. A correlation coefficient of +0.868 ( $p < .01$ ) indicated that the instrument was reliable.

#### Adjustment for Ability

The adjustment for ability was tested by timing a group of 40 children on puzzles representing the seven levels of difficulty in the task. Median scores, presented in Table VIII, confirmed the expectation that the greater the number of pieces in the puzzle the more difficult it would be. The scores also indicated, as expected, that the children in Group I were the most skillful and the children in Group III were the least skillful.

The puzzles task as adjusted for Group I children consisted of puzzles with 4, 5, 6, 7, and 8 pieces. For Group II children, the number of puzzle pieces were 3, 4, 5, 6, and 7; and for Group III children, the number of pieces were 2, 3, 4, 5, and 6. When this adjustment for ability was tested, the median scores for these assigned levels of difficulty were 10" to 80" for Group I, 9" to 94" for Group II, and 7" to 94" for Group III. These scores indicate that the assigned levels of difficulty did provide children in each ability group with puzzles that were easy and difficult relative to their own ability.

TABLE VIII

MEDIAN SCORES\* OBTAINED BY THREE ABILITY GROUPS  
ON PUZZLES GRADED IN DIFFICULTY

(N = 40)

Ability	N	Pretest Time (in seconds)	Number of Puzzle Pieces						
			2	3	4	5	6	7	8
Group I	09	0 - 30"	4"	8"	10"	13"	26"	81"	80"
Group II	2	31" - 45"	5"	9"	15"	26"	45"	94"	120"+
Group III	07	46" - 75"	7"	15"	29"	51"	94"	120"+	120"+

\*Time in seconds.

Willingness to Try Difficult Tasks

The major question to be answered in the data analysis was whether willingness to try difficult tasks was a function of ability, i.e., whether the more skillful children were more willing to try the difficult puzzles than were the less skillful children. A Chi-square analysis of the puzzles task data indicated that willingness to try difficult tasks was independent of ability. ( $\chi^2 = 2.303$ ; n.s.). The range of W-D scores on the puzzles task was from 40 to 80. Some children always chose the easy task, and some always chose the difficult task. This range was approximately the same for all age and ability groups, except Group II. (See Tables IX and X.) Chi-square analyses further indicated that there were neither age differences nor sex differences in willingness to try the difficult puzzles.

TABLE IX

CHI-SQUARE ANALYSIS OF THE DISTRIBUTION OF SUBJECTS  
BY SEX, ABILITY, AND W-D SCORES ON THE PUZZLES TASK

(N - 82)

Distribution	df	$\chi^2$	p
By W-D Scores and Sex	2	3.448	<.10
By W-D Scores and Age	2	0.610	n.s.
By W-D Scores and Ability	4	2.303	n.s.

**TABLE X**  
**RANGES AND MEDIAN W-D SCORES BY SEX, AGE, AND**  
**ABILITY ON THE PUZZLES TASK**

(N = 82)

	N	W-D Scores	
		Median	Range
<u>Age-Range</u>			
4:6 - 5:11	48	55	40 - 79
3:2 - 4:5	34	52	40 - 80
<u>Ability</u>			
Group I	39	56	40 - 80
Group II	22	48	40 - 65
Group III	21	55	40 - 80
<u>Sex</u>			
Boys	42	50	40 - 80
Girls	40	55	40 - 79
Total	82	53	40 - 80



### Target Game

The target game, pictured in Figures 8-10, was designed so that the range of distances to the targets would provide each child with choices between the easy and the difficult relative to his own ability.

Major steps in the pilot work, in which approximately 80 children participated, were the following:

1. Exploratory work with targets of various sizes showed that the style of the target, rather than its size, was of primary importance. A "responsive" target with a built-in "surprise" was needed. Only when confronted with this type of target were the children motivated to play the game in a way which revealed their willingness to try the difficult.
2. Children had difficulty staying behind a line when they rolled the ball to the target. To solve this problem, a square was marked on the floor with masking tape, and the children sat in this square when they rolled the ball.
3. A pretest was designed in which two balls were rolled to each of six targets placed at 2-foot intervals over a distance of ten feet. For children who had eight or more successes in this pretest, the target game was inappropriate. For them, none of the target distances were difficult. The pretest was shortened and the highly skilled children were eliminated from the study.
4. The target game was originally designed to offer ten choices between the easy and the difficult. A modified design, as used in the puzzles and buttoning tasks, offered 20 choices and proved to have greater discriminatory power than the shorter game.

### Target Pretest

In the pretest for the target game, the child rolled two balls to each of five targets, placed at distances of 1-foot, 3-feet, 5-feet, 7-feet, and 9-feet. The number of successes in the pretest determined the child's ability group and dictated the target distances that would be used for him.



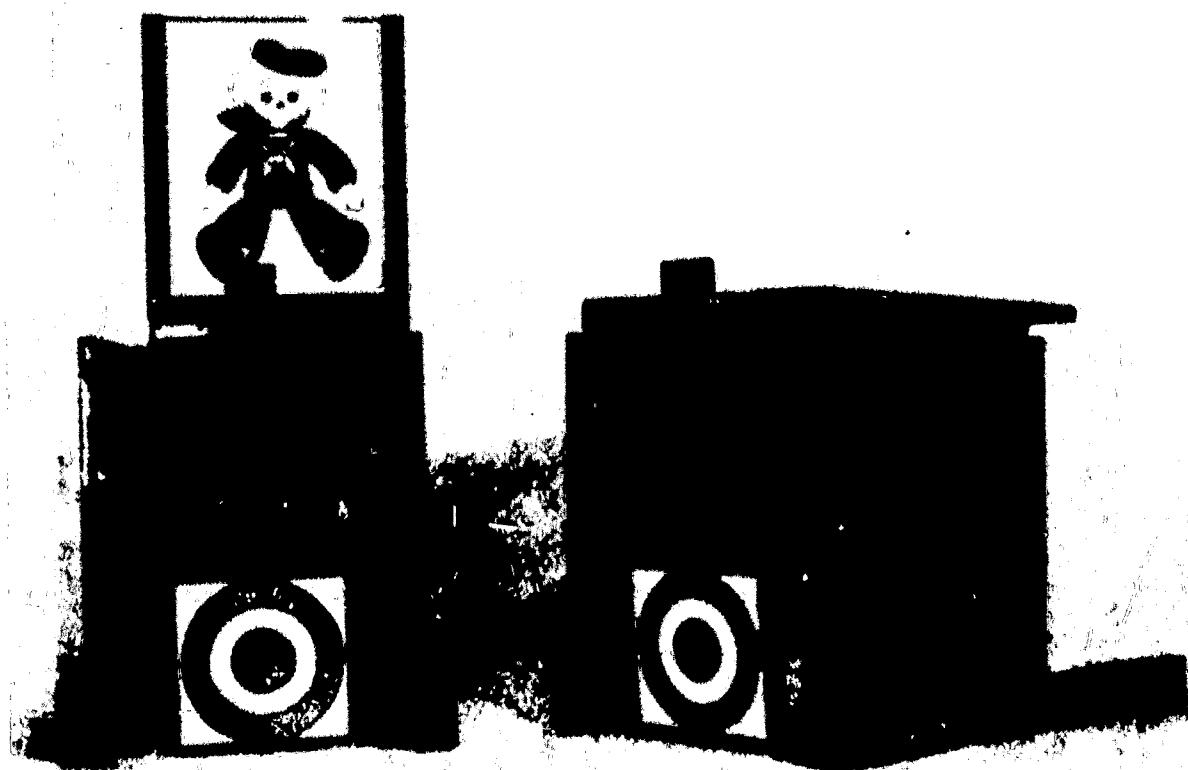


Figure 8. The target game - Open and closed targets.

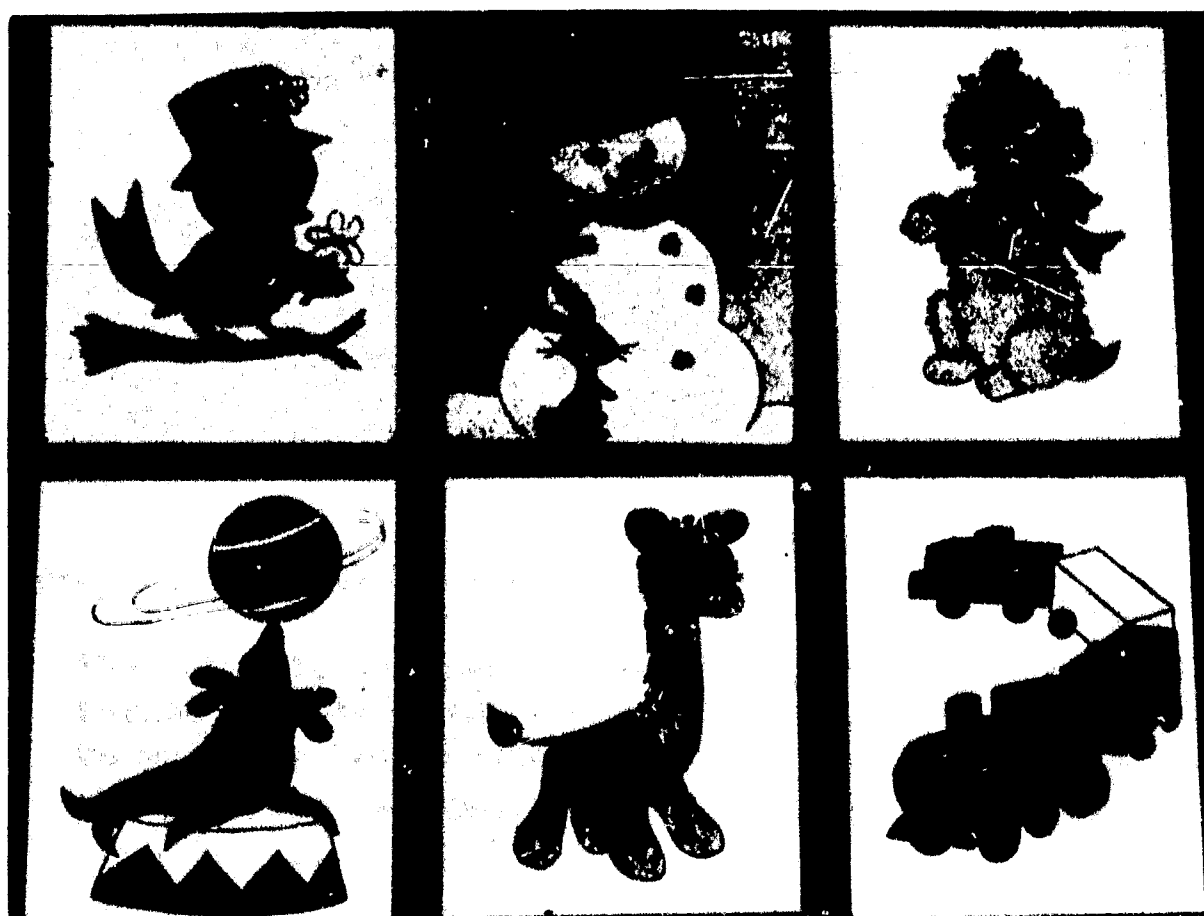


Figure 9. The target game - Six "surprise" pictures.



Figure 10. The target game - Complete instrument.

The complete instrument for the target game includes the target, a three-inch rubber ball, the cloth strip used to mark the target distances, the two markers used to indicate the possible choices, and 21 "surprise" pictures.

TABLE XI  
PRETEST SCORES AND TARGET GAME ADJUSTMENT  
FOR THREE ABILITY GROUPS

Ability	Successes in Pretest	Distance to Target at Each Level of Difficulty				
		A	B	C	D	E
Group I	6 or 7	3'	5'	7'	9'	11'
Group II	4 or 5	2'	4'	6'	8'	10'
Group III	2 or 3	1'	3'	5'	7'	9'

#### Target Instrument

The target was box-shaped and responded somewhat like a jack-in-a-box. When a bull's eye at the front of the target was hit, the lid opened and a "surprise" picture appeared. (See Figure 8.) This picture was removable; and once seen, it was replaced by another "surprise" picture.

Five levels of difficulty were offered to each child during the game. These were indicated by a strip of cloth on which two-foot intervals were marked. The cloth strip was placed along the target range so that the nearest target was one, two, or three feet from the child depending upon his ability. This adjustment for ability was such that the third target distance, i.e., the mid-point in the target range, was a distance at which the child had approximately a 50 per cent chance of success. During the game, the easy and hard distances between which the child chose were designated by small markers, a blue one with an "E" painted on it and a red one with an "H" painted on it.

Administration. Following the pretest, the target range was adjusted for the particular child. The experimenter then placed the "E" and "H" markers at the first two target distances and told the child that he could choose the place for the target ("box"). Holding the target off the floor, she indicated the two markers and said, "This is the easy place and this is the hard place. Where shall I put the box? At the easy place or at the hard place?" The target was then placed at the distance selected by the child and he was given two chances to hit the target. The target game continued in this manner and the child made a total of 20 choices between the easy and the difficult. The order of presentation of the paired levels of difficulty (target distances) was the same as that used in the puzzles and buttoning tasks. (See Target Score Sheet for Child-F-1271 in Figure 11.)

TARGET SCORE SHEET

Name CHILD-F-1271 Sex F  
 Birthdate 2-19-62 Age 4:2  
 Date of Test 4-19-66

Pretest:	<u>4</u>
Group:	<u>II</u>
# Balls:	<u>30</u>
# Difficult:	<u>5</u>
# Successes:	<u>11</u>
B+D-S Score:	<u>24</u>

	Number of	
	<u>Balls</u>	<u>Suc's</u>
1. (A) - B	<u>2</u>	<u>0</u>
(A) - B	<u>1</u>	<u>1</u>
2. C - (D)	<u>1</u>	<u>1</u>
(C) - D	<u>1</u>	<u>1</u>
3. A - (E)	<u>2</u>	<u>0</u>
(A) - E	<u>1</u>	<u>1</u>
4. (B) - C	<u>2</u>	<u>1</u>
(B) - C	<u>1</u>	<u>1</u>
5. (D) - E	<u>2</u>	<u>0</u>
(D) - E	<u>2</u>	<u>0</u>

	Number of	
	<u>Balls</u>	<u>Suc's</u>
6. A - (C)	<u>1</u>	<u>1</u>
A - (C)	<u>2</u>	<u>0</u>
7. (B) - E	<u>1</u>	<u>1</u>
B - (E)	<u>2</u>	<u>0</u>
8. (A) - D	<u>1</u>	<u>1</u>
(A) - D	<u>1</u>	<u>1</u>
9. (C) - E	<u>2</u>	<u>0</u>
(C) - E	<u>2</u>	<u>0</u>
10. (B) - D	<u>2</u>	<u>0</u>
(B) - D	<u>1</u>	<u>1</u>

Figure 11. Score Sheet - Performance of Child-F-1271 on the target game.

**Scoring.** In addition to the W-D score, several scores which could not be figured for the other tasks, were used in the analysis of the target game data. (See Table XII.)

An Ability score was figured from the child's performance during the game and indicated the point on the target range at which he actually had a 50 per cent chance of success. This score was figured by dividing the number of successes by the total number of trials (balls) at each level of difficulty. For Child-F-1271, the Ability score of 1.69 was figured as follows:  $0/4 + 1/5 + 2/8 + 4/7 + 4/6 = 1.69$ , indicating a point between the A and B target distances. In terms of feet, this score represented a point at 3.38 feet along the target range. This conversion to feet was figured by multiplying the distance between targets by the Ability score minus one and adding the distance to the first target. For Child-F-1271, the Ability score in feet was figured as follows:  $2(1.69 - 1) + 2 = 3.38'$ .

The B+D-S score provided an additional adjustment for ability by taking into account the skill with which the child actually played the game. This score is figured from the number of balls the child used (B), and the number of times he chose the difficult (D) in relation to the number of successes (S) he experiences while playing the game.

For the purpose of comparing the performances of children on all three research tasks, the B+D-S scores were converted to W-D scores. These converted scores had the advantage of being comparable to the original W-D scores and yet including a more refined adjustment for ability. The total possible range for the original W-D scores was from 40 to 80, and for the B+D-S scores was from 0 to 60. The conversion was achieved by adding 40 to 2/3's of the B+D-S score. For Child-F-1271, the converted W-D score of 56 was figured as follows:  $(2/3)(24) + 40 = 56$ .

TABLE XII  
RAW DATA AND COMPUTED SCORES FOR  
CHILD-F-1271 IN ABILITY GROUP II

Level of Difficulty (Weighted Score)	Number of Times Chosen	Weighted Score	Number of		
			Rolls	Difficult	Successes
E (5)	2	10	4	2	0
D (4)	3	12	5	1	1
C (3)	5	15	8	2	2
B (2)	5	10	7	0	4
A (1)	5	5	6	0	4

Ability in feet: 3.38'

Ability in terms of  
levels of difficulty: 1.69

W-D Score: 52

B+D-S Score: 24

Converted W-D Score 56

### Subjects

The subjects who participated in the target game were 101 children ranging in age from 3 years 0 months to 5 years 11 months. There was no significant difference in the distribution of boys and girls by age or by ability. (See Chi-square data in Table XIII.) The older children were significantly more skillful in the target game than were the younger children. ( $\chi^2 = 16.695$ ;  $p < .01$ ).

Detailed information about the distribution of subjects is presented in Tables XXXIV - XXXIX, Appendix A.



TABLE XIII  
CHI-SQUARE ANALYSIS OF THE DISTRIBUTION OF SUBJECTS  
BY SEX, AGE, AND ABILITY ON THE TARGET GAME

(N = 101)

Distribution	df	$\chi^2$	p
By Sex and Age	2	1.112	>.50
By Sex and Ability	2	3.951	<.20
By Age and Ability	4	16.695	<.01

#### Validity and Reliability

The target game was accepted as having face validity. Willingness to try the difficult was indicated by the choices which a child made between tasks which were easy and difficult relative to his own ability.

The internal consistency of the target game was determined by means of a split-half correlation using the Spearman-Brown formula. As in the other tasks, the sums of the weighted scores for alternate responses were used for this analysis. A correlation coefficient of +0.876 ( $p < .01$ ), obtained in an analysis of the scores of the first 52 children who participated in the target game, indicated that the instrument was reliable.

#### Adjustment for Ability

The adjustment for ability provided by the target pretest was planned so that each child would be offered easy and difficult tasks relative to his own ability. The skill demonstrated by each child during the target game provided the data necessary for an accurate evaluation of the pretest adjustment. Median ability scores for three ability groups, consisting of the first 52 children who participated in the target game, are presented in Table XIV. These scores are expressed in feet for a comparison of actual ability and are expressed in terms of the target range for an analysis of the pretest adjustment for ability.

If the adjustment for ability was adequate, the ability scores for the three groups of children should be significantly different, with the Group I children being the most skillful. A Kruskal-Wallis one-way analysis of variance indicated that the differences in the scores of the three groups of children were significantly different in the expected direction. ( $H = 11.675$ ;  $p < .01$ )

Also, if the adjustment was adequate, there should be no significant difference in the ability scores of the three groups when these scores are

expressed in terms of the target range. Data in Table XIV show that for all three ability groups the point at which the children had a 50 per cent chance of success was between the B-target (weighted 2.00) and the C-target (weighted 3.00). A Kruskal-Wallis analysis of variance indicated that these scores were not significantly different. ( $H = 0.983$ ; n.s.)

These analyses indicate that the pretest adjustment did provide children with easy and difficult targets relative to their own ability.

TABLE XIV  
MEDIAN ABILITY SCORES ON THE TARGET GAME EXPRESSED  
IN FEET AND IN TERMS OF THE TARGET RANGE  
(N = 52)

	Median Scores	
	Distance in Feet	Distance on Target Range
Group I	5.96'	2.48
Group II	4.40'	2.20
Group III	3.76'	2.38
H*	11.675 ( $p < .01$ )	0.983 (n.s.)

\*Kruskal-Wallis one-way analysis of variance

#### Willingness to Try Difficult Tasks

The major question to be answered in the data analysis was whether willingness to try difficult tasks was a function of ability, i.e., whether the more skillful children were more willing to try the difficult targets than were the less skillful children. (See Tables XV and XVI.)

A Chi-square analysis of the target data indicated that willingness to try difficult tasks was independent of ability. ( $\chi^2 = 7.510$ ;  $p < .20$ .) Rank order correlations between B+D-S scores and ability scores supported this finding. (For boys,  $\rho = +0.166$ ; n.s. For girls,  $\rho = +0.174$ ; n.s.)

Rank order correlations indicated that a relationship between age and willingness to try difficult tasks existed for boys, but not for girls. Older boys chose to play the target game at a more difficult level than did younger boys. ( $\rho = +0.307$ ;  $p < .05$ )

TABLE XV

CHI-SQUARE ANALYSIS OF THE DISTRIBUTION OF SUBJECTS BY SEX,  
ABILITY, AND B+D-S SCORES ON THE TARGET GAME

(N = 101)

Distribution	df	$\chi^2$	p
By B+D-S Scores and Sex	2	1.296	>.50
By B+D-S Scores and Age	4	7.268	<.20
By B+D-S Scores and Ability	4	7.510	<.20

TABLE XVI

SPEARMAN RANK ORDER COEFFICIENTS OF CORRELATION  
FOR TARGET GAME DATA

(N = 101)

	rho	p
Boys (N = 52)		
Ability and Age	0.537	<.01
Age and B+D-S Scores	0.307	<.05
Ability and B+D-S Scores	0.166	n.s.
Girls (N = 49)		
Ability and Age	0.300	<.05
Age and B+D-S Scores	0.055	n.s.
Ability and B+D-S Scores	0.174	n.s.

The more refined scoring of the target game, in the areas of ability and willingness to try the difficult, made possible a more extensive data analysis than was done for the puzzles and buttoning tasks.

Sex differences and age differences in ability were reanalyzed. A Mann-Whitney U test indicated that the boys were more skillful in the target game than were the girls. ( $U = 245$ ;  $p < .05$ ). A Kruskal-Wallis one-way analysis of variance indicated that the older children were more skillful than the younger children. ( $H = 9.315$ ;  $p < .01$ ). Rank order correlations among ability, age, and B+D-S scores supported this finding of a positive relationship between age and ability in the target game. (For boys,  $\rho = +0.537$ ;  $p < .01$ . For girls,  $\rho = +0.300$ ;  $p < .05$ ).

The range of B+D-S scores was from 04 to 39, indicating that some children chose to play an extremely easy game while others chose to play a rather difficult game. For the three year old children, the range of scores was from 08 to 29; for the least skillful children, the range was from 08 to 27; and for the girls, the range was from 04 to 28. None of these children made the game so difficult as did the older children, the more skillful children, and the boys. (See Table XVII.)

#### COMPARISON OF THE THREE RESEARCH INSTRUMENTS

The three research instruments designed to measure willingness to try difficult tasks, were administered to 40 children, ranging in age from 3 years 2 months to 5 years 9 months. Descriptive data and scores for these children are presented in Table XVIII. The tasks were administered in the same order to each child, the buttoning task first, the puzzles next, and the target game last; and the three were completed during a time interval of two weeks or less. Two experimenters gathered the data; but for each child, the same person administered the three tasks.

The data for the three tasks were analyzed to determine whether willingness to try the difficult was independent of ability, as had been indicated during the development of the instruments. For the buttoning task, the medium and low ability groups were combined, and a Mann-Whitney U test indicated no significant difference in the W-D scores for Groups I and II-III. ( $U = 116$ ; n.s.). The Kruskal-Wallis analysis of variance was used for the other two tasks. For the puzzles task, there was no significant difference in the W-D scores for the three ability groups ( $H = 1.191$ ; n.s.); and for the target game, there was no difference in the B+D-S scores. ( $H = 1.002$ ; n.s.)

The choice of methods for comparing the three tasks was influenced by the fact that ability was adequately controlled in the target game and crudely controlled in the other tasks. In the puzzles and buttoning tasks, the only possible adjustment for ability was the placement of each child in one of three ability groups for which the task could be adjusted. Within these groups, some children were necessarily more skillful than others.

Theoretically, a child's performance on any one of the tasks resulted

from the interaction of several variables, e.g., ability, willingness to try the difficult, and the potency of the situation. The question of whether or not the size of the W-D scores depended upon some condition or characteristic of a given task, as designed in the present research, was answered by a Friedman two-way analysis of variance by ranks. The W-D scores, as originally figured, were significantly lower for the target game than for the other tasks. ( $\chi^2 = 30.2$ ;  $p < .001$ ). The obviousness of each success and failure gave the child an accurate picture of the skill with which he was playing the target game, and the "surprise" pictures placed a high value on each success. These conditions apparently were responsible for the lower W-D scores on this task. The use of converted B+D-S scores, which provided an additional adjustment for ability, eliminated this problem to some extent. ( $\chi^2 = 3.2$ ; n.s.). The range of W-D scores for the target game was still smaller than the range for either of the other tasks. (See Table XIX.) In subsequent comparisons of the three tasks, the converted scores were used for the target game.

TABLE XVII  
RANGES AND MEDIAN B+D-S SCORES BY SEX, AGE,  
AND ABILITY ON THE TARGET GAME

(N = 101)

		B+D-S Scores	
	N	Median	Range
<u>Age Range</u>			
5:0 - 5:11	26	21	08 - 39
4:0 - 4:11	48	15	04 - 33
3:0 - 3:11	27	16	08 - 29
<u>Ability</u>			
Group I	33	16	06 - 39
Group II	46	19	04 - 35
Group III	22	13	08 - 27
<u>Sex</u>			
Boys	52	18	06 - 39
Girls	49	18	04 - 28
Total	101	18	04 - 39

(07 = H)

Sex and Code No.	Age	Buttoning Task			Puzzles Task			Target Game				
		Ability Group	Pretest Score	W-D Score	Ability Group	Pretest Score	W-D Score	Ability Group	Pretest Score	W-D Score	Converted W-D Score	
M - 1247	3:8	I	29	47	II	45	45	II	4	42	16	51
M - 1277	3:8	II	31	47	II	41	51	III	3	42	13	49
M - 1287	3:9	I	22	51	III	51	44	III	2	40	14	49
M - 709	3:10	I	22	46	II	38	61	III	3	41	12	48
M - 1284	3:10	III	52	44	I	29	80	III	3	42	09	46
M - 848	4:0	II	39	40	I	20	40	I	7	40	10	47
E - 1279	4:1	II	34	40	III	49	80	I	7	40	12	48
M - 1791	4:1	I	24	62	III	51	55	II	5	40	12	48
M - 1280	4:2	II	35	57	III	49	46	III	3	42	19	53
M - 703	4:4	I	22	57	II	32	48	I	7	40	11	47
M - 1767	4:4	II	32	63	I	30	57	II	4	41	17	51
M - 1774	4:4	III	52	53	II	32	56	II	5	53	22	55
M - 699	4:5	I	28	42	III	75	42	II	7	40	15	50
M - 1736	4:5	I	26	62	III	61	59	III	3	46	21	54
M - 1270	4:7	I	22	60	I	30	63	I	7	54	21	54
M - 1273	4:7	III	71	62	I	24	42	I	6	43	15	50
M - 1269	4:8	I	25	49	I	27	47	III	3	58	25	57
M - 1257	4:8	I	26	58	I	22	53	I	6	48	13	49
M - 1255	4:9	II	35	57	I	27	41	III	5	40	12	48
M - 1285	4:9	I	24	78	I	21	40	I	6	40	11	47
M - 579	5:3	I	22	59	III	46	60	I	7	63	23	55
M - 1249	5:7	I	29	57	III	51	61	II	4	47	13	49
M - 846	5:9	I	26	59	I	26	56	I	6	56	26	57
F - 1287	3:2	I	22	41	II	42	40	II	5	40	19	53
F - 1285	3:5	III	46	76	I	30	40	II	4	47	21	54
F - 1266	3:11	I	22	47	II	33	40	I	6	40	16	51
F - 1265	4:1	I	20	40	II	43	61	I	6	40	09	46
F - 1275	4:1	I	20	51	III	66	55	II	5	44	15	50
F - 1271	4:2	I	23	60	II	40	57	II	4	52	24	56
F - 691	4:3	II	32	60	II	34	62	I	7	40	09	46
F - 1268	4:3	I	21	53	II	35	50	II	4	40	11	47
F - 682	4:4	I	26	41	II	44	41	II	5	41	12	48
F - 1278	4:5	II	33	46	I	29	40	II	4	40	18	52
F - 1281	4:5	I	22	60	I	30	60	III	3	57	27	58
F - 1290	4:6	I	26	41	III	47	78	II	5	40	13	49
F - 598	4:9	I	20	60	I	22	69	III	3	40	11	47
F - 563	4:11	I	20	70	III	68	46	II	5	40	12	48
F - 574	5:3	I	29	74	I	19	56	I	7	43	16	51
F - 594	5:4	III	54	54	I	18	57	II	4	40	10	47
F - 602	5:4	I	30	49	I	29	47	I	7	41	12	48



TABLE XIX

MEDIAN AND RANGES OF W-D SCORES ON THREE RESEARCH  
TASKS DESIGNED TO MEASURE PRESCHOOL CHILDREN'S  
WILLINGNESS TO TRY THE DIFFICULT

(N = 40)

Task	Median	Range
Buttoning Task	56	40-78
Puzzles Task	54	40-80
Target Game	49	46-58

#### Consistency of W-D Scores

The consistency of the W-D scores for individual children was studied in a comparison of the three tasks. The tasks were paired, and the differences between the W-D scores were examined. Scores which were almost identical, i.e., which differed by no more than two points, were obtained by half the children (20 out of 40).

More than two-thirds of all paired W-D scores were similar, i.e., differed by no more than ten points. (See Table XX.) All but one child had similar W-D scores on at least two of the tasks; and half the children (20 out of 40) had similar W-D scores on all three tasks. The frequency of similar W-D scores on the paired tasks was greater than could be expected from chance. ( $\chi^2 = 22.54$ ;  $p < .001$ ).

The question of whether willingness to try difficult tasks is a constant personality characteristic implies a question about the relationship between ability and W-D scores. Does a given child demonstrate one degree of willingness to try the difficult in a situation in which he is highly skilled and another degree in a situation in which he is less skilled. To answer this question, 120 paired W-D scores were examined. Of these, 38 were for children who demonstrated the same relative ability on the paired tasks, and 82 were for children who demonstrated different ability on the paired tasks. (See Table XXI.)

A Chi-square analysis indicated that there was no significant difference in the frequency with which consistency in willingness to try difficult tasks was demonstrated by (1) children for whom the paired W-D scores represented the same ability group and (2) children for whom the paired scores represented different ability groups.

TABLE XX

COMPARISON OF THREE RESEARCH TASKS DESIGNED TO MEASURE  
PRESCHOOL CHILDREN'S WILLINGNESS TO TRY THE  
DIFFICULT: DISTRIBUTION OF DIFFERENCE  
SCORES AND CHI-SQUARE ANALYSIS

(N = 40)

Paired Tasks	Median	Range	Distribution of Difference Scores		$\chi^2$	p
			0-10	11-40		
Buttoning - Puzzles	05	00-40	28	12	6.40	<.01
Buttoning - Targets	08	01-31	30	10	10.00	<.01
Puzzles - Targets	07	01-34	28	12	6.40	<.01
Total	07	00-40	86	34	22.54	<.001

TABLE XXI

CHI-SQUARE ANALYSIS OF DIFFERENCES BETWEEN PAIRED  
W-D SCORES BY ABILITY GROUPS

(N = 120)

Range of Differences between W-D Scores for Paired Tasks	Ability Groups Represented by Paired Tasks			$\chi^2$	p
	Same	Different	Total		
00 - 02	09	17	26	0.113	>.50
00 - 09	32	55	87	1.076	>.50
00 - 40	38	82	120		

## SUMMARY AND CONCLUSIONS

Three instruments were developed for use in the measurement of pre-school children's willingness to try difficult tasks. These were (1) a buttoning task, based on fine motor coordination, (2) a puzzles task, based on the ability to see visual relationships, and (3) a target game, based on gross motor coordination. The general design of the three instruments was the same, and each was accepted as having face validity. As presented to the child, each instrument consisted of a set of five tasks graded in difficulty, and an adjustment was possible so that each child was offered easy and difficult tasks relative to his own ability.

In the game which the child played, the levels of difficulty were presented in pairs and the child chose the one that he wanted to do. In the manner of a paired-comparisons test, each level of difficulty was paired with every other level, and the order of presentation was such that the child started with the easier tasks and was gradually introduced to those which were more difficult. The scoring was a measure of the level of difficulty at which the child chose to play the game.

### Buttoning Task

Buttons ranging from 3/8" to 7/8" offered seven levels of difficulty for the buttoning task. The task proper consisted of 20 paired 1-button strips representing five levels of difficulty. The five levels appropriate for each child were selected on the basis of a pretest in which the child was timed on a 4-button strip; thus each child was provided with buttons which were easy and difficult relative to his own ability. A W-D score, which indicated a child's willingness to try the difficult, was figured from weighted scores for the levels of difficulty he chose during the task.

The subjects who participated in the development of the buttoning task were 145 children ranging in age from 3 years 0 months to 5 years 11 months. The older children were significantly more skillful in buttoning than were the younger children.

The reliability of the buttoning task, i.e., internal consistency, was determined by means of a split-half correlation. ( $r = +0.868$ ;  $p < .01$ ).

### Adjustment for Ability

The adjustment for ability was tested by timing children on 2-button strips representing the seven levels of difficulty. Median scores confirmed the expectation that the larger buttons were easier for all the children than were the smaller buttons, and that the pretest adequately distinguished between the more skillful and the less skillful children.

For the more skillful children (Group I), buttons of all seven sizes were rather easy and the task was not actually graded in difficulty. For the less skillful children (Groups II and III), the task was graded in difficulty, but their ability to button increased noticeably during the practice afforded by the task.

The design of the buttoning task was such that a more refined adjustment for ability was not possible. Of the three research tasks, the buttoning task was the least satisfactory.

#### Willingness to Try Difficult Tasks

Willingness to try the difficult, as measured by the buttoning task, was independent of ability. There were children in all age and ability groups who rarely chose the difficult task and others who rarely chose the easy task. The younger children (three year olds) were less willing to try the difficult than were the older children. This difference was in the expected direction.

#### Puzzles Task

Puzzles, ranging from two pieces to eight pieces, offered seven levels of difficulty for this task. The task proper consisted of 20 paired puzzles representing five levels of difficulty. The levels appropriate for each child were selected on the basis of a pretest in which the child was timed on three simple puzzles; thus each child was provided with puzzles which were easy and difficult relative to his own ability. The scoring was the same as that for the buttoning task; a W-D score indicated the level of difficulty at which the child chose to play with the puzzles.

The subjects who participated in the development of the puzzles task were 82 children ranging in age from 3 years 2 months to 5 years 11 months. The older children were significantly more skillful with the puzzles than were the younger children.

The reliability of the puzzles task, i.e., internal consistency, was determined by means of a split-half correlation. ( $r = +0.868$ ;  $p < .01$ ).

#### Adjustment for Ability.

The adjustment for ability was tested by timing children on a series of puzzles representing the seven levels of difficulty. Median scores confirmed the expectation that the puzzles with the greater number of piece were the more difficult, and that the pretest adequately distinguished between the more skillful and the less skillful children.

Median scores also indicated that the adjustment for ability was adequate. The puzzles assigned to each ability group represented levels of difficulty which provided the children with easy and difficult puzzles relative to their own ability.

### Willingness to Try Difficult Tasks

Willingness to try the difficult, as measured by the puzzles task, was independent of ability. Some children always chose the easy puzzles, and others always chose the difficult. There were neither sex differences nor age differences in willingness to try difficult puzzles.

### Target Game

The target game was designed so that a range of distances to the target would provide each child with choices between the easy and the difficult relative to his own ability. The target was box-shaped and responded somewhat like a jack-in-a-box. When a ball's eye at the front of the target was hit, the lid opened and a "surprise" picture appeared. Success and failure were obvious to the child, and the "surprise" picture was a motivating factor not present in the puzzles and buttoning tasks. Each child's ability was determined in a pretest, and the range of target distances was adjusted accordingly. Five target distances representing five levels of difficulty were used in the task proper.

The scoring for the target game took into consideration the skill with which the child actually played the game, thereby offering a more refined adjustment for ability than was possible in the other tasks. The B+D-S score was figured from the number of balls the child used (B), and the number of times he chose the difficult (D) in relation to the number of successes (S) he experienced while playing the game. This score was converted to a W-D score for use in the later comparison of the three research instruments.

The subjects who participated in the development of the target game were 101 children ranging in age from 3 years 0 months to 5 years 11 months. The older children were significantly more skillful in the target game than were the younger children; and the boys were more skillful than the girls.

The reliability of the target game, i.e., internal consistency, was determined by means of a split-half correlation. ( $r = +0.876$ ;  $p < .01$ ).

### Adjustment for Ability

The adjustment for ability was tested by a statistical analysis of the children's ability scores expressed in feet and expressed in terms of the target range. This type of analysis was possible only for the target game, not for the puzzles and buttoning tasks.

The target pretest adequately distinguished between the more skillful and the less skillful children. The ability scores, expressed in feet, were significantly different for the children in the three ability groups, with the children in Group I being the most skillful.

The adjustment of the target range did provide the children with easy and difficult targets relative to their ability. There was no significant



difference in the ability scores of the children in the three groups when these scores were expressed in terms of the target range. For all groups, the point at which the children had a 50 per cent chance of success was a point between the second and third targets.

### Willingness to Try Difficult Tasks

Willingness to try the difficult, as measured by the target game, was independent of ability. An age difference in willingness to try the difficult existed for boys, but not for girls. Older boys chose to play the target game at a more difficult level than did the younger boys.

### Comparison of the Three Research Instruments

The three tasks were administered to 40 children, ranging in age from 3 years 2 months to 5 years 9 months. The consistency of the W-D scores was then studied by comparing the similarity of the scores obtained by these children on the three tasks. The choice of methods for this comparison was influenced by the fact that ability was adequately controlled in the target game and only crudely controlled in the other tasks.

An analysis of the W-D scores for paired tasks, e.g., puzzles and targets, indicated that the frequency of similar W-D scores was greater than could be expected by chance. For half the children (20 out of 40), the W-D scores on at least two of the tasks were almost identical, i.e., the scores differed by no more than two points. For all but one child (39 out of 40), the W-D scores on at least two tasks were similar, i.e., the scores differed by no more than ten points; and for half the children, the W-D scores for all three tasks were similar.

The apparent consistency of W-D scores was independent of ability. There was no significant difference in the frequency with which this consistency was demonstrated by (1) children for whom the paired W-D scores represented the same ability group and (2) children for whom the paired scores represented different ability groups.

### Conclusions

A preschool child's willingness to try difficult tasks can be isolated for research purposes when other variables, such as ability and factors affecting the potency of the situation, are controlled.

The possibility that willingness to try difficult tasks may be a personality constant is suggested by the findings of the present research. No conclusive analysis was possible because of the rather crude control of ability in the puzzles and buttoning tasks.

Of the three instruments developed in the present research, the target game is the most promising for future use. Success or failure in hitting



the target provides the child with obvious evidence of his own skill and provides the experimenter with an objective measure of the child's ability. As a result, an accurate and discriminating measure of a child's willingness to try the difficult is possible with this instrument.

### IMPLICATIONS FOR FUTURE RESEARCH

#### Constancy of Willingness to Try Difficult Tasks

The question of whether willingness to try the difficult, or risk-taking, is a constant personality characteristic was not adequately answered in the present research. Another instrument is needed, one similar in design to the target game but based on a different skill. The ability of the child and factors which affect the potency of the situation need more adequate control than was possible with the puzzles and buttoning tasks. With two tasks of comparable refinement and discriminatory power, an adequate study of the constancy of willingness to try the difficult should be possible.

A new task should have a method of scoring which provides an additional adjustment for ability, as is possible in the target game; and the child's actual skill in the task should be obvious to him, as it is in his successes and failures in the target game. A series of puzzle boxes, similar to that developed by Keister (1937) could be designed to meet these criteria.

#### A Target Game for Older Children

Instruments for use with young children and comparable instruments for use with older children are needed for longitudinal studies of creative ability. Exploratory work with the target game, as designed for young children, indicated that it is not suitable for older children. These children were not interested in the "surprise" pictures; and avid bowlers, seven and eight years old, hit the target at 40 feet.

An instrument for older children must be based on a more complex skill and need not have the "surprise" element. A beanbag target game, which demands accuracy in both the direction and the strength of the throw, could be designed to meet the criteria identified in the present research and would be suitable for use with older children.

The incorporation of these two instruments in a longitudinal study should aid in the discovery of influences which encourage or handicap the development of creative ability.

#### The Relationships among Characteristics

The target game, for the measurement of willingness to try the difficult, is one of several instruments currently being used in an exploratory study of characteristics and abilities assumed to be related to creative

expression and creative learning. An understanding of the relationships among these characteristics and their relationship to intellectual factors, which are the usual focus of achievement and intelligence tests, is needed. Only if distinct factors have been isolated by the several tests can a profile of these characteristics be of value in a study of the creative potential of young children. For example, the measurement of originality must be independent of verbal ability.

Approximately 150 children ranging in age from 3 years 0 months to 5 years 11 months, are participating in the exploratory study. The following characteristics and abilities are being tested: verbal ability, pre-school achievement, originality, curiosity, willingness to try the difficult, and freedom to use conforming and nonconforming behavior. The results will serve as a guide in the necessary refinement of some of the instruments and in the planning of the next major study of the creative potential of young children.

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## APPENDIX A

# **BUTTONING TASK - DISTRIBUTION OF SUBJECTS**

TABLE XXIII

DISTRIBUTION OF SUBJECTS BY SEX AND AGE  
ON THE BUTTONING TASK

Age	Boys	Girls	Total
5:0 - 5:11	13	06	19
4:0 - 4:11	41	36	77
3:0 - 3:11	24	25	49
Total	78	67	145

$\chi^2 = 2.070$ ; n.s.

TABLE XXIII

DISTRIBUTION OF SUBJECTS BY SEX AND ABILITY  
ON THE BUTTONING TASK

Ability	Boys	Girls	Total
Group I (High)	38	37	75
Group II (Medium)	29	23	52
Group III (Low)	11	07	18
Total	78	67	145

$\chi^2 = 0.676$ ; n.s.

TABLE XXIV

DISTRIBUTION OF SUBJECTS BY AGE AND ABILITY  
ON THE BUTTONING TASK

ABILITY	AGE GROUPS IN YEARS AND MONTHS			Total
	3:0 - 3:11	4:0 - 4:11	5:0 - 5:11	
Group I (High)	19	42	14	75
Group II (Medium)	19	30	03	52
Group III (Low)	11	05	02	18
Total	49	77	19	145

$\chi^2 = 12.411$ ;  $p < .02$

TABLE XXV

DISTRIBUTION OF SUBJECTS BY SEX AND W-D SCORES  
ON THE BUTTONING TASK

W-D Scores	Boys	Girls	Total
60 - 80	23	18	41
50 - 59	22	16	38
40 - 49	13	13	26
Total	78	67	145

$\chi^2 = 0.728$ ; n.s.

TABLE XXVI

DISTRIBUTION OF SUBJECTS BY AGE AND W-D SCORES  
ON THE BUTTONING TASK

W-D Scores	Age Group (in years and months)			Total
	3:0 - 3:11	4:0 - 4:11	5:0 - 5:11	
60 - 80	06	29	06	41
50 - 59	13	19	06	38
40 - 49	30	29	07	66
Total	49	77	19	145

$\chi^2 = 11.028$ ;  $p < .05$

TABLE XXVII

DISTRIBUTION OF SUBJECTS BY ABILITY AND W-D SCORES  
ON THE BUTTONING TASK

W-D Scores	Ability Group			Total
	I	II	III	
60 - 80	25	12	04	41
50 - 59	20	14	04	38
40 - 49	30	26	10	66
Total	75	52	18	145

$\chi^2 = 2.642$ ; n.s.



# PUZZLES TASK - DISTRIBUTION OF SUBJECTS

TABLE XXVIII

DISTRIBUTION OF SUBJECTS BY SEX AND AGE  
ON THE PUZZLES TASK

Age	Boys	Girls	Total
5:0 - 5:11	09	10	19
4:0 - 4:11	27	24	51
3:0 - 3:11	06	06	12
Total	42	40	82

$\chi^2 = 0.003$ ; n.s.

TABLE XXIX

DISTRIBUTION OF SUBJECTS BY SEX AND ABILITY  
ON THE PUZZLES TASK

Ability	Boys	Girls	Total
Group I (High)	18	21	39
Group II (Medium)	10	12	22
Group III (Low)	14	07	21
Total	42	40	82

$\chi^2 = 2.667$ ; n.s.

TABLE XXX

DISTRIBUTION OF SUBJECTS BY AGE AND ABILITY  
ON THE PUZZLES TASK

Ability	AGE expressed in years and months 3:2 - 4:5	4:6 - 5:11	Total
Group I (High)	07	32	39
Group II (Medium)	14	08	22
Group III (Low)	13	08	21
Total	34	48	82

$\chi^2 = 17.043$ ;  $p < .001$

TABLE XXXI

DISTRIBUTION OF SUBJECTS BY SEX AND W-D SCORES  
ON THE PUZZLES TASK

W-D Scores	Boys	Girls	Total
60 - 80	09	15	24
50 - 59	13	13	26
40 - 49	20	12	32
Total	42	40	82

$\chi^2 = 3.448$ ;  $p < .10$

TABLE XXXII

DISTRIBUTION OF SUBJECT BY AGE AND W-D SCORES  
ON THE PUZZLES TASK

W-D Scores	AGE expressed in years and months 3:2 - 4:5	4:6 - 5:11	Total
60 - 80	09	15	24
50 - 59	10	16	26
40 - 49	15	17	32
Total	34	48	82

$\chi^2 = 0.610$ ; n.s.

TABLE XXXIII

DISTRIBUTION OF SUBJECTS BY ABILITY AND W-D SCORES  
ON THE PUZZLES TASK

W-D Scores	Y	ABILITY	III	Total
60 - 80	11	06	07	24
50 - 59	15	05	06	26
40 - 49	13	11	08	32
Total	39	22	21	82

$\chi^2 = 2.303$ ; n.s.

# TARGET GAME - DISTRIBUTION OF SUBJECTS

TABLE XXIV

DISTRIBUTION OF SUBJECTS BY SEX AND AGE  
ON THE TARGET GAME

Age	Boys	Girls	Total
5:0 - 5:11	11	15	26
4:0 - 4:11	26	22	48
3:0 - 3:11	15	12	27
Total	52	49	101

$\chi^2 = 1.112$ ; n.s.

TABLE XXV

DISTRIBUTION OF SUBJECTS BY SEX AND ABILITY  
ON THE TARGET GAME

Ability	Boys	Girls	Total
Group I (High)	21	12	33
Group II (Medium)	19	27	46
Group III (Low)	12	10	22
Total	52	49	101

$\chi^2 = 2.951$ ;  $p < .20$

TABLE XXVI

DISTRIBUTION OF SUBJECTS BY AGE AND ABILITY  
ON THE TARGET GAME

Ability	Age expressed in years and months			Total
	3:0 - 3:11	4:0 - 4:11	5:0 - 5:11	
Group I (High)	02	19	12	33
Group II (Medium)	13	22	11	46
Group III (Low)	12	07	03	22
Total	27	48	26	101

$\chi^2 = 16.695$ ;  $p < .01$

TABLE XXVII

DISTRIBUTION OF SUBJECTS BY SEX AND B+D-S SCORES  
ON THE TARGET GAME

B+D-S Scores	Boys	Girls	Total
25 - 39	12	07	19
15 - 24	22	24	46
04 - 14	18	18	36
Total	52	49	101

$\chi^2 = 1.296$ ; n.s.

TABLE XXVIII

DISTRIBUTION OF SUBJECTS BY AGE AND B+D-S SCORES  
ON THE TARGET GAME

B+D-S Scores	Age expressed in years and months			Total
	3:0 - 3:11	4:0 - 4:11	5:0 - 5:11	
25-39	02	09	08	19
15 - 24	14	19	13	46
04 - 14	11	20	05	36
Total	27	48	26	101

$\chi^2 = 7.268$ ;  $p < .20$

TABLE XXIX

DISTRIBUTION OF SUBJECTS BY ABILITY AND B+D-S SCORES  
ON THE TARGET GAME

B+D-S Scores	Ability Group			Total
	I	II	III	
25 - 39	07	10	02	19
15 - 24	15	24	07	46
04 - 14	11	12	13	36
Total	33	46	22	101

$\chi^2 = 7.510$ ;  $p < .20$